App. F. IX-4

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Previous References. 1945-46 ( ) File No. 2-45

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Later References.

PRESERVED

GENERAL AND REVENUE SECRETARIAT

Serial Nos. One

Part B for July 1945

SUBJECT

Deputation of Mysore officers to study the methods of Irrigation and assessment Systems in the U.P and Punjab

2474

30.6.45

Recorded.

D.O. No. MYSORE PUBLIC WORKS DEPARTMENT,
CENTRAL OFFICE,

Dated Bangalore, the 10th April 1944.

P. W. SECRETARIAT. 52/5 Date 12.6.1944

of 194 .

Dear Mr. Narasimha Murti,

OFFICE OF THE MINISTER FOR PUBLIC WORKS 12 APR. 1944 No. 6565

Subject:- Deputation of Mysore Officers to study the methods of Irrigation and assessment systems in the United Provinces and the Punjab.

6466.

1. We enclose herewith, a brief note on the Irrigation and Revenue Assessment systems obtaining in Northern India, for favour of submission to the Dewan.

With regards,

Yours sincerely,

Sd/ M N Lakshmana Rao
Executive Engineer.

Sd. C. Rajagopal
Asst Supdt of Land Records
Survey and Settlement.

C. Narasimha Murti, Esq., M.A.,
Private Secretary to the Dewan of Mysore,
Bangalore.

2. with copies of Enclosures.
Copy submitted to Secretary to Govt, P.W.D. for favour of kind perusal.

M N Lakshmana Rao
Executive Engineer

Sent with a draft.

Issue 21/4/44

Issued in No P.W. 7589 dated 21/7/44

Letter No 24674/S dated 30-6-1945 from the Chief Engineer for Irrigation forwarding a report on the merits of the Irrigation and assessment system in vogue in the United

WT 01094—GPB—20,000—25-2-41

42

Provinces and the Punjab as compared with those prevailing in Mysore.

5. May be Subd ~~to Govt~~ for perusal with reference to the Ministers Minute dated 15-4-1944 in para 4 ~~supra~~ overleaf.

6/7

5-7-45.

Min'ſ'r P.W.I.)

For perusal. w/r/t para 4.

OFFICE OF THE MINISTER FOR PUBLIC WORKS
16 JULY 1945
No. 386

Read

26/7/45

Deputation of Mysore Officers to study the Methods of Irrigation and Assessment Systems

in

UNITED PROVINCES AND PUNJAB.

CONTENTS

1. A brief note regarding the Special features noticed during the tour and how far they are applicable to our State.

2. A Report of the study of Methods of Irrigation and Assessment Systems prevailing in United Provinces and Punjab.

i). Introduction

ii). Places visited and works studied with dates.

iii). Irrigation Works in Punjab, United Provinces. Tube Well Irrigation.

iv). Land Tenure and Soils.

v). Land Revenue Assessment System.

vi). Crops grown and duties of water realised. Methods of Regulation and distribution of water.

A BRIEF NOTE ON THE SPECIAL FEATURES NOTICED DURING THE DEPUTATION TOUR AND HOW FAR THEY CAN BE APPLIED IN OUR STATE.

A description of the various typical Irrigation Works seen during the tour in United Provinces and Punjab is furnished in the body of the report. The inferences drawn from a study of the above is submitted below for favour of kind consideration.

Enforcing stricter adherence to the systems of regulation and thereby not only improving the duties of water but also preventing deterioration of soil by over irrigation.

One Special Feature that impressed us most during our study was the rigid strictness with which the regulation and distribution of water under the Canals was being conducted according to the rules and systems in force; and the amenability of the consumers to implicitly adhere to the systems without exceptions or deviations, thus making it possible not only to ensure maximum efficiency in the use of water but also to prevent deterioration of soils by too intensive irrigation. The high duties of water realised in United Provinces and Punjab are in a great measure due to this rigid enforcement of systems of regulation.

In our State also, there exist such regulation systems as for instance, 'The triennial rotation under the Irwin Canal' but it has not been possible to strictly enforce the same on account of various special circumstances. In the case of sugar-cane under Irwin Canal, which is a heavy duty crop drawing water for 17 months, though the area according to the

system had to be only 1/3 area of the cane zone. on account of certain difficulties in planting, the area actually given water for cane has had to be increased year after to almost the whole area of the zone. thus not only entailing the consumption of three times the normal requirement of water, but what is more important, hastening the dete rioration of the soil by persistent irrigatio It may be very beneficial to encourage strict adherence to the rotational system, without at the same time prejudicing local interests. for which ways and means could be devised, if necessary by a Committee formed of all parties concerned.

2 Improvement of duty of water by the introduction of lighter duty crops like wheat, pulses irrigated Jawar and Ragi etc., in place of heavy duty crops like rice and sugar-cane, wherever possible.

The crops most generally grown in United Provinces and Punjab are wheat and pulses which require much less water than paddy or sugar-cane. Paddy requires 4 times and sugar-cane 6 times as much water as wheat or pulses. As such, wherever there is limited supply of water as under tanks, and tail reaches of Canals etc., it is more advantageous to gradually bring about introduction of light duty crops in place of heavy duty ones. as far as possible, so that a larger area of crops with a yield of higher value may be grown with the same amount of water.

3 Growing of subsidiary crops such as fodder crops, vegetables potatoes, etc., in addition to main crops in irrigated area.

Most of the irrigated area in United Provinces and Punjab are double cropped. Subsidiary crops like fodder crops and vegetables such as peas, potatoes, cabbages, and Cauliflower are grown in abundance,

after the main crop is harvested. Our ryots feel perfectly satisfied if they get one crop from their land. Sufficient inducement to grow such subsidiary crops may be given by fixing 1/3 the usual rates for fodder crops and 1/2 the rate for vegetable crops. Healthy cattle is necessary for good agriculture. Gomal lands in irrigated areas are non-existent and as such encouragement in this direction is very necessary.

Lift Irrigation from Canal water to grow garden crops like vegetables, fruits etc., on flat areas where available on upper margin.

By carefully conserving water and increasing the duties of water it may be possible to develop lift irrigation in the upper margin wherever flat areas are available at 10 to 15 ft. height above the channel by employment of Picotas, Persian wheels, or Electric pumps and pumps worked by steam engine. This is what one of our former Chief Engineer says with regard to lift Irrigation. "Irrigation by pumping can be arranged for lands above such of the channels as the Hampapur Right Bank, Kattepur, Raja Parameswari, Devaraj and to some extent under other channels also". The importance of this irrigation is considerable."

Garden crops such as vegetables, fruits, and semi dry commercial crops like Chillies, etc., may be grown levying concession water rates at half the usual rates.

Supply of water on volumetric basis to large holdings.

In the case of large holdings such as Government Farms, Sugar Company Farms and supply of water to Inam villages when

Canals pass through them. levy of assessment on volumetric basis may be tried on the same terms as are prevailing in Punjab. as this system encourages them to make economic use or water on scientific lines realising higher duties and thereby result in benefit both to them and to Government. Successful results in the case of such experiments will incidentally be of great educational value to the adjacent ryots who are accustomed to [redacted] wasteful methods of irrigation.

The Rates of assessment may be fixed at Rs.2-8-0 per day per cusec during monsoon season and Rs.5/- per day per cusec during summer.

b Co-operative Farming

In Montgomery district, Co-operative societies have sprung up to take up land for its members to cultivate it either collectively in which case the produce is pooled or individually in which case, each member receives a separate holding. Each Society has been given 300 to 400 acres for distribution to its members and so far as Government is concerned the society is responsible for the observation of all obligations attached to a colony grant. The introduction of this system in the Canal area, as for instance in the bringing under irrigation of large extent of 15,000 acres Government waste lands under Irwin Canal and other projects like Byramangala, Kanva etc., which have been lying undeveloped for a long time, may be tried with advantage.

Tapping of underground spring water for irrigation by means of tube wells.

In the taluks of Goribidanur and Madhugiri, there was considerable irrigation by Talapariges in former days. These Talapariges have ceased to function now and there is a clamour that the areas formerly treated as wet may be converted into dry.

The Talapariges have become dry probably owing to the water table being shifted to a lower depth. It is a matter for consideration whether the underground water which was freely flowing on the surface by ordinary excavation of channels, may not be tapped by erection of tube wells so successfully established in United Provinces.

Improvements of hikkals under Canals.

Laying out of the hikkals under Canals may be done by the Department alone, acquiring the land actually necessary and their positions could be definitely fixed both on ground and on specially prepared out-let maps to prevent their being meddled with, any variation being promptly noticed and the culprit dealt with. This will check the ever increasing troubles arising from hikkals ~~as they exist and are being managed now.~~

Contour bund.

Method of irrigation by contour bunds may be tried in the district of Kolar, Tumkur and Chitaldrug where rainfall is scanty and the soil retentive.

Both

Necessity of openings an arrigation Research station in our State.

Both United Provinces and Punjab have Research stations with experimental Farms where experiments are carried on to find solutions of their irrigation problems as they arise. As the kind of crops and nature of soils and other irrigation conditions are entirely different here, it is desirable to have a Research station of our own established, ~~though on a smaller scale to begin with~~, where we can carry out experiments and find out solutions for our ever-arising indegenious problems and evolve improvements both over our methods of construction and ~~over~~ methods of irrigation.

Conclusion.

Our thanks are due to all the officers of the Irrigation Department of both the Provinces who took great pains in showing us round the works. They were uniformly cordial and gave us all facilities for studying the works.

All the persons we came in contact with had high regard for the progressive administration of our State and expressed their very high esteem for the noble ideals of our esteemed Ruler, His Highness the Maharaj

*****

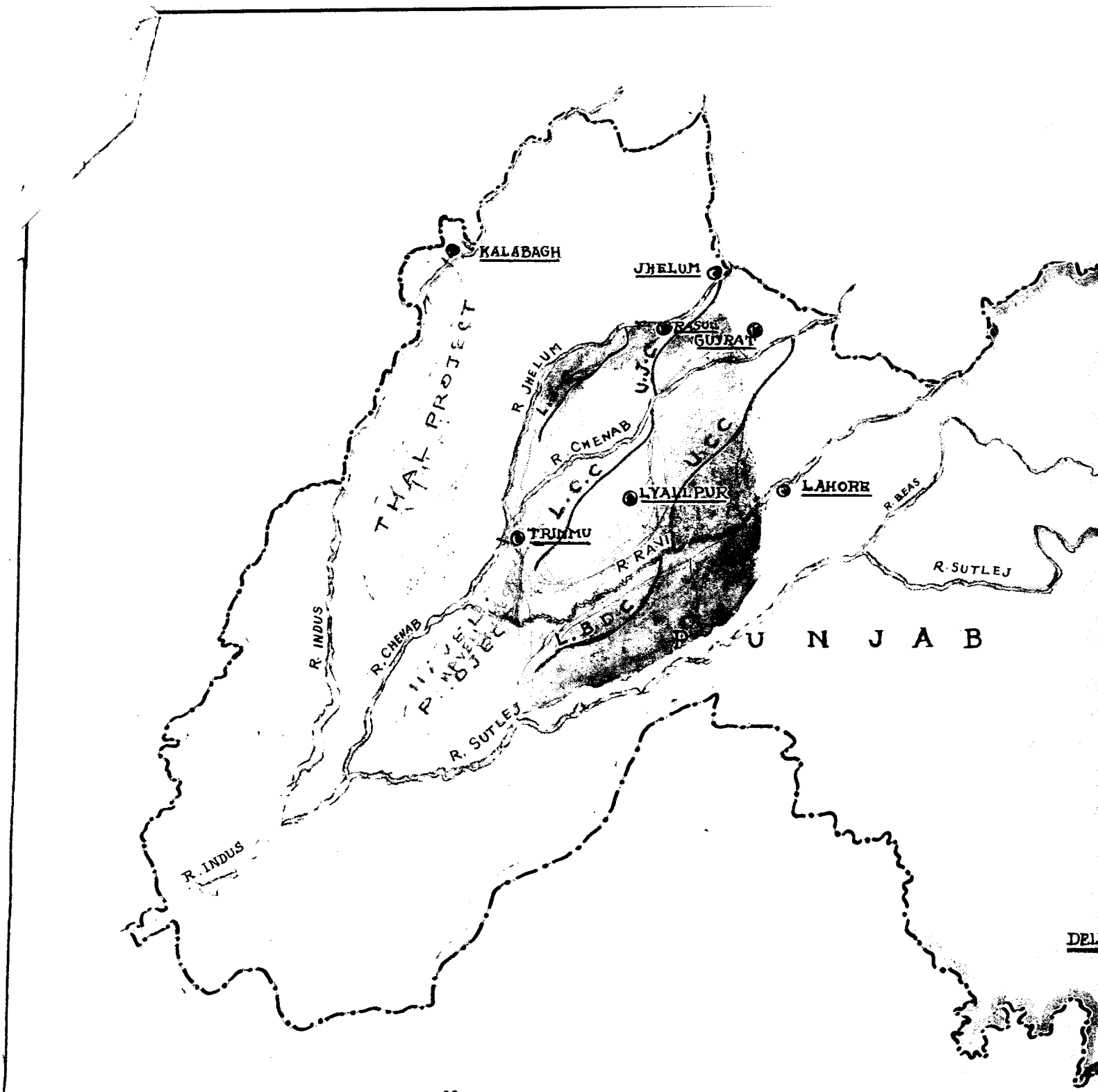
C. Rajagopal 10.4.44
Assistant Superintendent of Land records, Survey and Settlement

M N Lakshmana Rao
10-4-44
Executive Engineer

ITENERARY OF JOURNEYS MADE AND PLACES AND WORKS VISITED DURING THE DEPUTATION.

DATE.	CAMPS.	WORKS STUDIED.
		UNITED PROVINCES.
24-1-1944 to 27-1-1944	Jhansi	(1) Pahuj Dam and Canals. (2) Betwa Dam and Canals.
28-1-1944 to 6-2-1944	Meerut	(1) Ganges Canal:- Head works, Cross drainage works, Main Canal and distributaries and field irrigation from a Minor and actual distribution from an outlet. (2) Hydro-Electric Power stations at Bahadurabad, Salava, Bhola. (3) Tube wells.
7-2-1944	Delhi	Attended Central Irrigation Office.
8-2-1944	Mutra	Irrigation under Mutra Canal.
9-2-1944 to 10-2-1944	Agra	Irrigation under Agra Canal.
11-2-1944 to 13-2-1944	..	Casual leave.
14-2-1944	Lucknow	
		PUNJAB.
16-2-1944 to 17-2-1944	Lahore	(1) Irrigation under Ferozpore Canal. (2) Irrigation Research station.
18-2-1944	Jhelum	Irrigation under Upper Jhelum Canal
19-2-1944 and 20-2-1944	Guzarat	Irrigation under Guzarat Branch Canal.
21-2-1944 to 23-2-1944	Rasul	(1) Head works across Jhelum river. (2) Lower Jhelum Canal. (3) Rasul Engineering School.
24-2-1944 to 28-2-1944.	Lahore	Attended Punjab Engineers Congress Sessions and visit to Institutions.

29-2-1944 to 3-3-1944	Lyallpur.	(1) Irrigation under Lower Chenab Canal. (2) Agricultural College. (3) Field Research station at Risalwala
4-3-1944 to 6-3-1944.	Trimmu.	Haveli Canal Project across Chenab river (cost Rs 3.7 ax crores to irrigate 19 lakhs acres).
7-3-1944 and 8-3-1944.	Kalabagh	Thal Project across Indus river (costing Rs 7 crores to irrigate about 16 lakhs acres). Latest type of Barrage with silt excluders etc recently completed and Canal work in progress.
10-3-1944 and 11-3-1944	Lahore	Irrigation Research Institute.
15-3-1944 and 16-3-1944	Poona	Irrigation Research station at Khadak Vasla. Agricultural College. Irrigation under Mutha Canal.
19-3-1944	Bangalore.	



Scale 63.1 miles to an 9nch

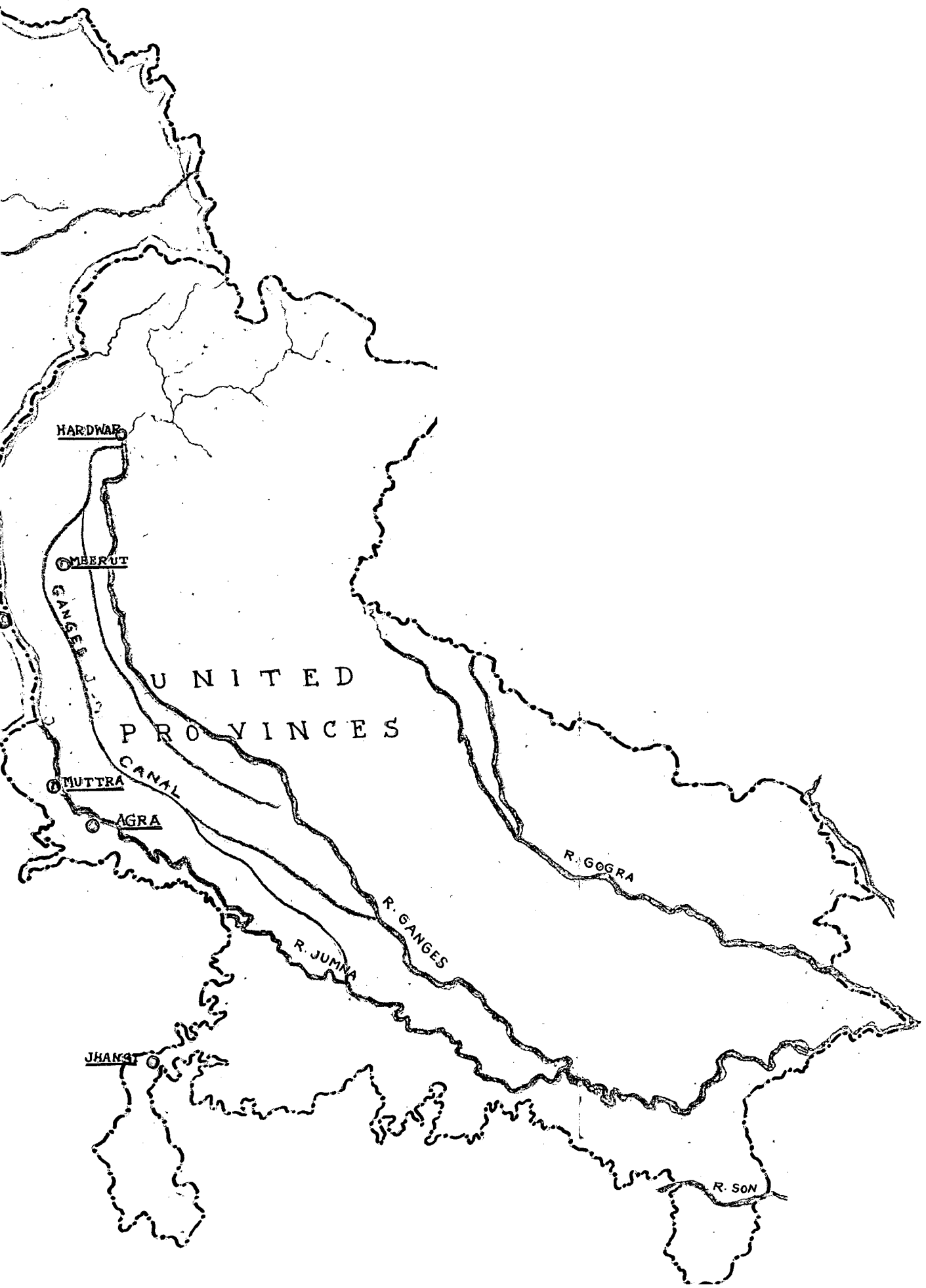
C-R of Jhelum 10.4.44
Assistant Superintendent
of Land records, Survey and Settlement.

M N Lakshmana Rao
10-4-44
Executive Engineer

MAP OF UNITED PROVINCES AND PUNJAB

SHOWING

IRRIGATION WORKS



A REPORT OF THE STUDY OF THE METHODS OF IRRIGATION AND ASSESSMENT SYSTEMS PREVAILING IN THE UNITED PROVINCES AND PUNJAB.

Introduction.

In pursuance of G.O. No. P.W.S.4751-5, dated 17.1.1944, deputing One Executive Engineer and one Revenue Survey Officer to study the methods of irrigation and assessment systems prevailing in the United Provinces and the Punjab, we the undersigned Officers toured through these two provinces from 17.1.1944 to 19.3.1944, visiting a number of important typical irrigation works according to a programme kindly planned out and given to us by the Irrigation Chief Engineers of the two respective Provinces.

A list of the places where camps were made and the works seen and studied at each camp with dates, is submitted herewith for favour of information. It will kindly be seen that the irrigation works inspected comprised of varied types and magnitudes, such as:-

(1) Head Works across important rivers, like Ganges, Indus, Jhelum, Chenab, etc.,

(2) Large Canal systems taken off from these rivers in the Punjab and the United Provinces.

(3) Hydro-Electric generating stations on the Ganges Canal.

(4) Smaller Canals drawn from Reservoirs and lakes in Bundelkhand portion of United Provinces.

(5) Irrigation under State Tube wells

worked by Electric pumps.

(6) Minor irrigation from contour bunds, and from ordinary wells by means of manual labour

(7) Two irrigation projects of big magnitude in the stage of progress i.e., "Haveli Canal Project" across Chenab river and "Thal Project" across Indus river.

In addition to the above irrigation works, we also visited the following institutions, for collecting informations and data on subjects allied to irrigation.

1. Irrigation Research Institutes at Lahore and Poona.

2. Field Experimental station for water requirements of various crops at Risalwala.

3. Agricultural Colleges at Lyallapur and Poona.

4. Engineering College at Roorke and Engineering School at Rasul.

We have collected some litarature regarding results of investigations conducted in the above Research and experimental stations. We have obtained also the Government publications of the Irrigation Department such as Irrigation Manual, Revenue Manual, Canal Acts, P.W.D. Code. Administration Report of irrigation Department etc., and also collected samples of the forms used at various stages of measurements and assessment of Revenue and water rates. They are submitted separately for information of Government.

Irrigation in Punjab

Punjab owes its prosperity to the construction of its Canals. Fifty years ago the Punjab was the poorest province, subject to frequent famines owing to drought, or flood

which carried away all crops that may have existed on the river banks. The Districts of Sahpur, Lyallpur, Jhang, and Montgomery, which till recently were mere arid deserts or rolling sand dunes, have now as a result of the labours of the Canal Engineers become one of the granaries of the world.

Irrigation works in Punjab.

There are seven important systems of Government Canals:-

1. The western Jumna Canal takes its water from the river Jumna near where it leaves the mountains and waters the S.E. Portion of the Punjab.

2. The Sirhind Canal is an old system. It takes water from the Sutlej river and irrigates the South east portion also.

3. The lower Chenab Canal is one of the largest irrigation works in India. A great weir was built across the river at Khanki.

4. The upper bari Doab Canal takes its water from the Ravi river where the Ravi leaves the mountains.

5. The lower Jhelum Canal takes its water from the Jhelum at Rasul.

6. Triple Canal system is one of the cleverest examples of irrigation systems. The upper Chenab Canal takes its water from the Chenab at Marrala near the foot of the Himalayas. The main Canal is carried across the river Ravi by an aqueduct and becomes known as the lower Bari Doab Canal. When the Upper Chenab Canal came into existence, it was found that the entire water of the Chenab river was diverted, so much so, that none would be left in the Chenab Canal. And so, the upper Jhelum Canal was built at Mangala to bring water from the Jhelum to the Chenab at Khanki to fill the Lower Chenab Canal.

7. At Trimmu below the junction of Jhelum and Chenab another weir is put up. This is known as 'The Haveli Project'. The Canals drawn irrigate nearly a

nearly a million acres. The special feature about the Canal which runs to a length of 50 miles is that the whole canal is lined with Reinforced brick and cement at a cost of nearly a crore of rupees. This lining is done with the object of preventing absorption of water in the course of its transit.

There as another large project which is still in the course of construction at Daudkhel across the Indus. The estimated cost is roughly stated to be seven crores of Rupees. The head works have been completed on the most up-to-date lines with silt ejectors and silt excluders. The Canal work is not yet taken up. It is expected to irrigate nearly a million and a half Acres of arid tract between the Indus and the Jhelum.

The labours of the Canal Engineer do not seem to end with these projects. They have a still more ambitious plan to harness the flood waters and investigations have been completed to construct a dam at Bhakkar. The sanction of the Local Government for this construction seems to have been obtained already and the site for the construction of the dam selected for the purpose.

A still larger reservoir seems to be under investigation in the hill ranges of the Himalayas for the purpose of developing Hydro-Electric power for the Punjab and also irrigate large areas in the United Provinces. This affects the fortunes of both the provinces of the United Provinces and the Punjab. An American expert, Mr. Savage recently visited the area for the selection

of the site at a little above Chakrata in company with Sir William Stampe.

The annexed statement shows the different Canals in the Punjab, the capital outlay, the net amount realised, and the percentage of profit on the capital invested. It will be seen from the annexed statement that an extent of nearly 13 million acres in the Punjab is now under irrigation which would otherwise have been mostly waste with no income to Government. The total cost of the works is 41 crores yielding a net revenue of 6 crores or a return of 14.6%.

It is however to be mentioned that the sudden development of extensive irrigation in what was once an arid waste land has brought with it serious problems, which have to be solved. The underground salinity of the soil has begun to rise up to the surface in large patches as a result of intensive irrigation, and appreciable areas have become water logged and unfit for cultivation. An independent Circle under a Superintending Engineer has been formed to try various remedial measures to deal with these problems.

Irrigation in United Provinces.

In the United Provinces there are similar net works of Canals and though they are not so extensive as in the PUNJAB, they are of older standing and the soil is much more fertile. The oldest of them is the Upper Ganges Canal with its head works at Haridwar

and the Jumna Gangetic valley through which it passes is a level and fertile tract of extraordinarily rich and uniform soil. The country is fully irrigated and splendidly cultivated by Jats who are stated to be the most industrious and skilful of all the agricultural classes and the quality of the crops raised here are said to be unsurpassed.

The discharge in the Ganges Canal is 8,000 Cusecs, and with this heavy flow which is more or less constant due to melting snow in summer, Hydro-Electric power is generated at a number of places where vertical drops of 15 to 20 ft. occur along its course. There are 9 such power stations erected at a cost of Rs. 3·63 crores and generating a power of 29.700 Kilo-watts.

A statement of the Irrigation works in U.P. showing the capital costs, areas irrigated, revenue and returns, is annexed for information. There are about ~~28,000~~ 17000 miles of Canals in the United Provinces constructed at a cost of 40.1 Crores, to irrigate an extent of 53 lakhs of acres and yielding a net revenue of Rs.1.9 crores.

Tube Wells.

The soil in the Gangetic valley being made up of deep layers of alternating sand and clay and no rock being met with for several hundreds of feet below ground an abundant and unlimited supply of underground spring water is available for being tapped

for irrigation. In fact there is stated to be a third river the Saraswathi flowing underground between the river the Jumna and the Ganges. A very effective scheme to tap this underground supply by means of State Tube Wells and utilise it for irrigation on an extensive scale, has been in good progress for the last 10 years and has proved highly successful.

Experiments are being widely carried out in different provinces of northern India to tap the underground resources of water and utilise it for developing irrigation. Sir William Stampe, Irrigation Adviser to Government of India has very recently recommended that an area of 29,900 acres in the North West Frontier Province is considered suitable for Irrigation by Tube Wells, and as an experimentary measure 10 standard Tube Wells may be installed at suitable points in these areas.

The Tube Wells consist of {borings fitted with steel tubes of 8" diameter} about 200 to 300 ft. deep from which water is pumped up by electricity supplied from Hydro-electric power stations on the Ganges Canal. Each tube well with an average yield of 1½ cusecs, is intended to command about 1 sq. mile of the country. Water is supplied for irrigation on volumetric basis at the rate of 30,000 Gallons per Rupee.

The number of state tube wells opened up to 1940-41 is 1,500 erected at a total cost of Rs.1.5 Crores and the area irrigated was 6.7 lakhs acres yielding a net revenue of Rs. 3.59 lakhs. Though there is a demand for further tube wells in fresh areas the heavy rise in prices of machinery and steel tubes have appreciably checked further progress in this direction and experiments are being conducted to reduce the cost by using R.C.C. tubes and wooden strainers in place of steel ones.

Irrigation in Bundelkhand portion of the United provinces.

This portion of the United Provinces is in marked contrast with the western part described above. The soil here is rocky and less fertile and there are neither perennial rivers of big size nor sufficient assured rain fall with the result that famine and scarcity were not uncommon in the tract. As such, the irrigation works constructed in this area are mostly of a protective nature, yielding revenues of only 1½ to 2%; and consist of small Canals drawn from moderately sized reservoirs put up across jungle streams which run full in rains but are almost dry in summer. Water is very sparingly given from these channels which are opened only for 2 or 3 weeks in a season giving only one watering to the crops, a second watering being allowed only if supply is available. It is generally found that this one watering supplemented by any rains during the period

is sufficient to assure an eight anna crop in the whole atchkat, which is the basis for levying full assessment. If water for a second watering is ax available, or should there be better rains the ryot will obtain full crops for which no extra charge is made.

Contour bunds.

The rain fall in Bundelkhand being scanty and precarious and there being no othe sources of irrigation, effort is made to conserve and make maximum use of the rain-water by putting up long bunds across flat and suitable areas to hold up rain-water in ponds 2 to 3 ft. in depth, without allowing it to run off into valleys. As soon as the water soaks into the ground the bed is sown and the moisture held by the retentive soil will be sufficient to bring the crops to maturity. The assessment charged for thi type of irrigation is Rs.2-8-0 to Rs.4-0-0 per acre.

Irrigation of margin of Reservoirs as water recedes.

Irrigation of the upper margin of reservoirs after water recedes:- The value of irrigation is so high in this tract, that no possibility of raising a crop is left unutilised. In the case of all storage reservoirs, when the water level goes down after the rains, the wetted margin land is given out for cultivation on Eksal or ONE SEASON basis. The lease is sold by auction as each strip of land emerges out from under water. There is a keen demand for such lands which are rendered fertile by deposits of silt, and a seasonal rent of Rs.5/- per acre is usually realised.

Land Tenure.

The most general tenure in the United Provinces is the Zamindari tenure. The Zamindar is the person with whom the Government enters into a contract for payment of a certain sum as land tax each year. He is a sort of a middle man, who has become the direct proprietor of the land.

The Zamindar's share of land revenue is 55% and that of Government is only 45% It has to be remembered that land revenue does not include irrigation assessment.

But in the Punjab, the system of assessment is mostly Ryotwari. The Government enters into a contract with each individual separately for payment of assessment and the settlement period is for a period of 20 years. The irrigation assessment is a separate levy. Besides the land revenue and the irrigation assessment the proprietors will have to pay local cesses which aggregate to 20% of the taxes they have to pay on land.

Government property is of the following classes:-

1. Nazal such as metalled road, inspection houses, School, cattlepound.
2. State property managed under the control of the Board of Revenue
3. Land belonging to (1) Canal of Forest Department and (2) Imperial Department.

S o i l s:-

The soil in the United Province is more fertile than in the Punjab. There is in the latter province considerable impregnation of salt in the soil which comes to the surface when the soil dries up

after watering. Thére are large areas covered with sand dunes. The country is flat in both the provinces and the soil alluvial.

Silt is brought from the mountainous area by the rivers and deposited in the plains, thus rendering the area very fertile.

The soils are very deep with alternating layers of sand and clay in both the provinces. Broadly speaking, soil classes may be divided into wet and dry i.e., irrigated and non-irrigated.

Area treated as wet are those which have been irrigated from Canal or masonary well in at least 2 out of 5 normal years ending with the year of record and irrigation from earthern wells has not been taken into account.

The local names for the broad division of soils are as follows:-

BARA:- for the fields immediately round the village site, enjoying special facilities for manure and irrigation.

SEOTA:- Loamy soil. Any land outside the Bara area and recognised as being distinctly superior by reason of position, special facilities for manure or irrigation or general facility to the main average soil of the village.

DAKAR:- Hard stiff clay growing do fasli crops fairly regularly sometimes including

rice.

BHUR:- Sandy soil on a fairly level ground or gently undulating surface which can bear EK FASLI crop.

KACHIANA:- Land regularly used for the cultivation of vegetables, tobacco, garden produce, or valuable fruit excluding country mangoes.

KHADIR:- Alluvial soil.

The principles of settlement are the same in Punjab as in the United Provinces.

The soil classification in Mysore is done entirely on different lines. It is the Bombay system that has been adopted.

The soil here is not so deep as in the United Provinces or as in the Punjab nor is it so very fertile.

The depth of soil here is not more than 3 feet and below it is either rock or hard ground. The nature of the country is undulating. Any Canal system can only be taken on the contour of the valley. The soils here are divided into three main classes. (1) Black cotton Soil (2) Red loam (3) Whitish grey. ~~which is~~ These are again sub divided into 9 classes according to the depth of the soil, defective ingredients such as sand, Kankar, sloping ground, presence of salt etc.,

Land Revenue Assessment System.

As mentioned already all lands in the United Provinces and the Punjab are divided into two classes, irrigated and unirrigated. ~~The basis assessment is rupee one to rupees two for un-~~ irrigated

~~and un-irrigated.~~ The basic assessment is Rupee one to Rupees two for un-irrigated land and Rs.6/- to Rs.13/- for irrigated area. The determination of the assessment depends according to the nature of soil, the nearness of roads, the proximity of the market etc., as is in Mysore. It is the Civil department which prepares the account for the basic revenue both in the United Provinces and the Punjab for all irrigated and un-irrigated land, but the irrigation assessment is a separate levy according to a schedule of rates, for which separate statements are appended. The accounts are prepared under the supervision and control of the Irrigation Department P.W.D.

The irrigation assessment is only optional. Land holders who use water for irrigation are taxed according to the nature of the crop. If no water is used, there is no water rate levied. Hence the irrigation assessment is merely a fluctuating income, though it forms the bulk of the land revenue in these provinces.

For lands which come under the atchkat of big irrigation projects there is no system of levying contribution from the atchkatdars as is in vogue in Mysore. There is no permenent right to water created which a levy of contribution in Mysore would entail.

There is another tax known as the "Water advantage rate" which is levied from the tenant for the benefit of the land lord.

The demand statements are prepared separately for the two sessions in the year by the Irrigation

Dep

Department by employing a separate Revenue staff. These statements are sent to the Civil Department for collection. They are collected in a lump for the two seasons separately, whereas in our State it is the Revenue Department that is entirely responsible for the demand and collection. The Revenue is collected ~~in~~ here in four Khists commencing from February.

The optional system in the United Provinces and the Punjab has the effect of stabilising the prices for land whether irrigated or un-irrigated whereas in Mysore, there is considerable difference in prices for the dry and wet which depends entirely on the nature of the soil, source of irrigation, proximity of the village to the roads, availability of labour for cultivation.

The value of land which was sold at Rs.12-8-0 per acre in the Canal districts of the Punjab in ~~every~~ early years has gone so high as Rs.2,000/- at present, and even at this rate lands are difficult to be obtained.

Payment by Volume.

There has been some instances in Punjab when water is supplied on volumentic assessment to large land-holders. The supply is measured as it enters the water course from the distributary The amount paid is more than what a land owner would have had to pay under an assessment by acreage.

Lift Irrigation

In addition to the usual flow irrigation the Canal water is also profusely made use of by lift Irrigation i.e., Higher lands adjacent to Canals are irrigated by leading the Canal water into shallow wells within a distance of 100 to 150'

from the Canal and lifting it by 10 to 15 ft. by means of Persian wheels or by power pumps and using it for irrigating high bits of lands on the upper margin. The cropsgrown are grams and vegetables and the assessment for such irrigation will be only about half the usual charges or even less as shown in the list of water rates appended.

Duties of an Irrigation Officer.

The duties of an Irrigation Officer both in United Provinces and Punjab are as noted below;--

1. The construction and maintenance in efficient order of all means for carrying and distributing water.

2. The economic distribution of water in order to secure the greatest amount of irrigation and measuring and recording of the area irrigated.

3. The supervision of the demand Statement of the irrigation assessment twice in the course of a year by Canal Patwaries.

4. Granting of remissions of assessment whenever there is failure of crops.

Crops raised and duties of water realised.

The crops grown are mostly wheat, pulses, and oil-seeds like mustard and rape seed etc., which require very much less water than paddy. The Sugarcane grown here is of drier variety than here which matures in 10 months and requires only one watering in 15 to 21 days.

The country being quite level and flat for miles and the soil being alluvial and retentive, and the crops grown being more or less dry crops, the conditions are in every way favourable for

economical use of water and realisation of very high duties. The duties realised in United provinces and the Punjab are as follows:-

1). Flow of 1 cft. of water per second irrigates:-

264 acres of wheat grams oil seeds etc.,
100 " " Sugar cane.
40 " " Paddy.

2). One million cft of water suffices for:-

16 acres of wheat, grams, oil-seeds, etc.,
5 acres of sugar cane.
4 acres of paddy.

Subsidiary Crops

In addition to these main crops subsidiary crops like peas, vegetables, fodder crops, like Bersem and Lucerne are invariably grown after the main crop is harvested.

Regulation of Water in Canals

The Canals in United Provinces and Punjab run all the twelve months in the year, except for periods of break when there is no demand on account of rains. There are two irrigation seasons "KHARIF" from 1st April to end of September and "RABI" from 1st October to end of March.

Being a flat country, the area commanded by the channel is much more than what the supply can irrigate at a time and as such about half the area is irrigated during Kharif and half in 'Rabi' by turns.

The outlet from the channel is usually a 'Module' to give a constant discharge irrespective of the variations of supply depth in the channel and is so designed as to give a sufficient flow to irrigate @ 50% of the whole commanded area

in the course of two weeks or 3 weeks.

Distribution of water.

The distribution of water beyond the channel outlet is attended to by the consumers themselves. This is done by them in a very regular and methodical way. All the consumers implicitly follow the rules and systems laid down by the Canal authorities.

The lay-out of hikkals and their maintenance is done by the Department itself and all hikkals are Government property. Their positions are definitely fixed on ground and also marked on outlet maps specially prepared on which even the points at which each cultivator is to draw his water are shown. This procedure is seen to effectively control hikkal disputes and irregularities.

Irrigation Research Stations.

To cope up with the ever increasing irrigation problems and to evolve better forms of construction and improved methods of cultivation, both the United Provinces and the Punjab have established Irrigation Research Stations of their own at Lucknow and Lahore, with a number of subsidiary field experimental stations.

The following investigations were being conducted:-

1. Carrying out of experiments on models prepared to scale to arrive at solutions to various problems, such as scours of banks or of beds, shifting of river basins, heavy silting at particular points etc.,

2. Testing the efficiency of silt selective

heads and different types of silt excluders and silt ejectors.

3. Silt analysis with Puris Siltometer.

4. Testing the efficiency of various types of linings for the channel.

5. Evolving methods of reducing percolation under Channels and thereby checking water logging such as soil compaction method, etc.,

6. Methods of dealing with problem of water logging and efflorsence of salt due to irrigation.

Field Experimental Stations.

The following investigations are made in the Field Experimental stations:-

1. To determine the optimum depth of water required for different crops.

2. The best way of utilising the water available by varying the time of application, depth of irrigation and the frequency of application.

3. Economic use of water by simple cultural methods such as size of beds, flat and furrow irrigation, shallow versus deep tillage and interculture and manuring.

******

M N Lakshmana Rao
10-4-44
Executive Engineer

C. Rajagopal 10.4.44
Assistant Superintendent of Land records, Survey and Settlement.

Statement showing the water rates in force on

'TRIPLE CANAL' in Punjab.

Item No.	Nature of crop	Per acre irrigated		Remarks.
		Flow irrigation.	Lift Irrigation.	
1	2	3	4	5
	Sugar cane and water nuts	9- 0- 0	4- 8- 0	Per acre per crop
	Rice	7- 8- 0	3- 12- 0	-Do-
	Orchards garden, tobacco, Poppoy, Indigo, vegetables and wheat (Half year)	5- 0- 0	2- 8- 0	-Do-
	Cotton, Fibres, Dyes, oil seeds, Rabi crop except wheat gram, Masu, senji and Turnips.	4- 0- 0	2- 0- 0	-Do-
	Chariand all Khariff crops not otherwise specified.	3- 0- 0	1- 8- 0	-Do-
a)	Gram, Masu, Turnips and crops grown on the water of previous crop.	2- 4- 0	1- 2- 0	-Do-
b)	Single watering before ploughing for rabi followed by rabi crop.	-Do-	-Do-	Per acre.
1)	Grams, village and District Board plantations for any numbering waterings in Khariff season.	1- 4- 0	0-10- 0	per half year.
2)	-Do- Rabi season.	1- 4- 0	0-10- 0	-Do-
3)	-Do- for two waterings in the Rabi season.	2- 8- 0	1- 4- 0	
	Waterings for ploughing not followed by any crop in the same succeeding harvest.			
	1) For any number of waterings between 1st May and 15th July.	0- 8- 0	0- 4- 0	Per acre.
	2) after 15th July	1- 8- 0	0-12- 0	-Do-
	3) Torea and gram sown together in the same field.	5- 0- 0	2- 8- 0	Per acre per crop

Chief Wheel 10.4.44
Asstt. Supdt. of Land Records
Survey and Settlement

STATEMENT SHOWING RATES IN FORCE ON CANALS IN THE UNITED PROVINCES DURING THE YEAR ENDING MARCH 31, 1941.

1- Schedule of Occupiers' R

In Ordinary Areas

(1) Upper Ganges canal, Lower Ganges canal, Eastern Jumna canal, and Agra canal. (Except for lands irrigated in the Delhi and Gurgaon districts)

Item No.	Nature of Crop	Per acre irrigated						
		Flow			Lift			
1	2	3			4			5
		Rs	a	p	Rs	a	p	
1	Sugarcane(UpperGanges and Eastern Jumna canals)	10	- 0	- 0	4	- 0	- 0	Year
2	Sugarcane(Lower Ganges and Agra canals)	9	- 0	- 0	3	- 0	- 0	"do
3	Rice(Upper Ganges and Eastern Jumna canals	7	- 8	- 0	3	- 0	- 0	Crop
4	Rice (Lower Ganges and Agra canals	6	- 0	- 0	2	- 8	- 0	Do.
5	Vegetables, orchards, gardens and waternuts	6	- 0	- 0	2	- 8	- 0	Orchards & gardens per half Year, the rest per Crop.
6	Other Kharif Crops	3	- 0	- 0	1	- 8	- 0	Crop.
7	Wheat and barley	5	- 0	- 0	2	- 8	- 0	Do
8	Gram	2	- 8	- 0	1	- 4	- 0	Do
9	Linseed, Peas, Poppy, tobacco and other rabi crops.	4	- 0	- 0	2	- 0	- 0	Do
9a	Lucerne, berseem and all fodder grasses and clovers	3	- 0	- 0	1	- 8	- 0	Half Year
	Where the supply of canal water has been proclaimed by notification to be precarious, the rates will be the same as above except in the following cases.							
10	Sugarcane	7	- 8	- 0	3	- 0	- 0	Year
11	Other Kharif Crops	2	- 8	- 0	1	- 0	- 0	Crop
12	Wheat and barley	4	- 0	- 0	2	- 0	- 0	Do

10-4-44
A Sd/- Supdt of Land records
Survey and Settlement

Statement showing the irrigation work in U.P. (The total length of the channels, Capital Out-lay, total irrigation extent and net revenue).

No.of work.	Name of work.	Mileage in operation.		Area irrigated.	Total sum at charge.	Net Revenue.	Percentage on capital out-lay to the end of the year.
		Main canal and branches.	Distributaries.				
1.	A. Irrigation works. (1) Productive works.	Miles.	Miles.	Acres.	Rs	Rs	
1.	Upper Ganges Canal-	568	3,382	1,539,739	4,47,96,780	68,20,972.	G. 15. 23
2.	Lower Ganges Canal	662	3,148	867,584	4,20,56,510	32,69,844	G. 7. 77
3.	Eastern Jumna Canal.	129	809	427,371	61,23,135	25,08,700	G. 40. 97
4.	Agra Canal	100	896	386,198	1, 23,86,527	11,24,449	G. 9. 08
5.	Sarada Canal.	912	3,430	902,611	16,03,48,051	26,49,171	G. 2. 63
6.	Bijnor canals.	-	78	26,713	6,00,859	60,452	G. 10. 06
7.	Ramganga Canal.	-	101	23,276	48,83,662	— 33,332	L. 1. 31
8.	State tube wells.	-	3	671,294	1,74,76,127	3,58,243	G. 2. 32
9.	Tube wells taken on lease by Government.	-	-	1,873	21,567	1,760	G. 10. 54
10.	Hydro Electric grid	-	-	-	3,65,81,221	13,96,371	G. 3. 82
11.	Daurala Sugar Cane. Tramway-	-	-	-	5,46,846	2,985	G. 0. 82
12.	Fyzabad electricity and Gogra pumping scheme.	-	120	21,020	29, 47,402	— 90,219	L. 3. 74

	Total(1) Productive works.	2,371	11,967	4,867,679	32,87,68,687	1,80,69,398	G. 6. 84
	(2) Unproductive works.						
1.	Rohilkhand canals.	-	276	38,419	39,94,615	70,838	G. 3. 05
2.	Dun Canals.	-	91	17,701	26,86,377	1,43,335	G. 5. 34
3.	Betwa canal.	157	617	124,730	1,90,27,436	3,25,837	G. 3. 78
4.	Dhasan canal	107	186	42,156	1,17,81,991	58,014	G. 1. 15
5.	Pahuj and Garhmau canals.	-	67	6,537	17,58,718	13,890	G. 1. 66
6. to 22		- X	X	- X	X	- X	- X
	Total(2) Unproductive works.	417	1972	422,769 *1,135	7,25,00,490	9,11,181	G. 2. 46

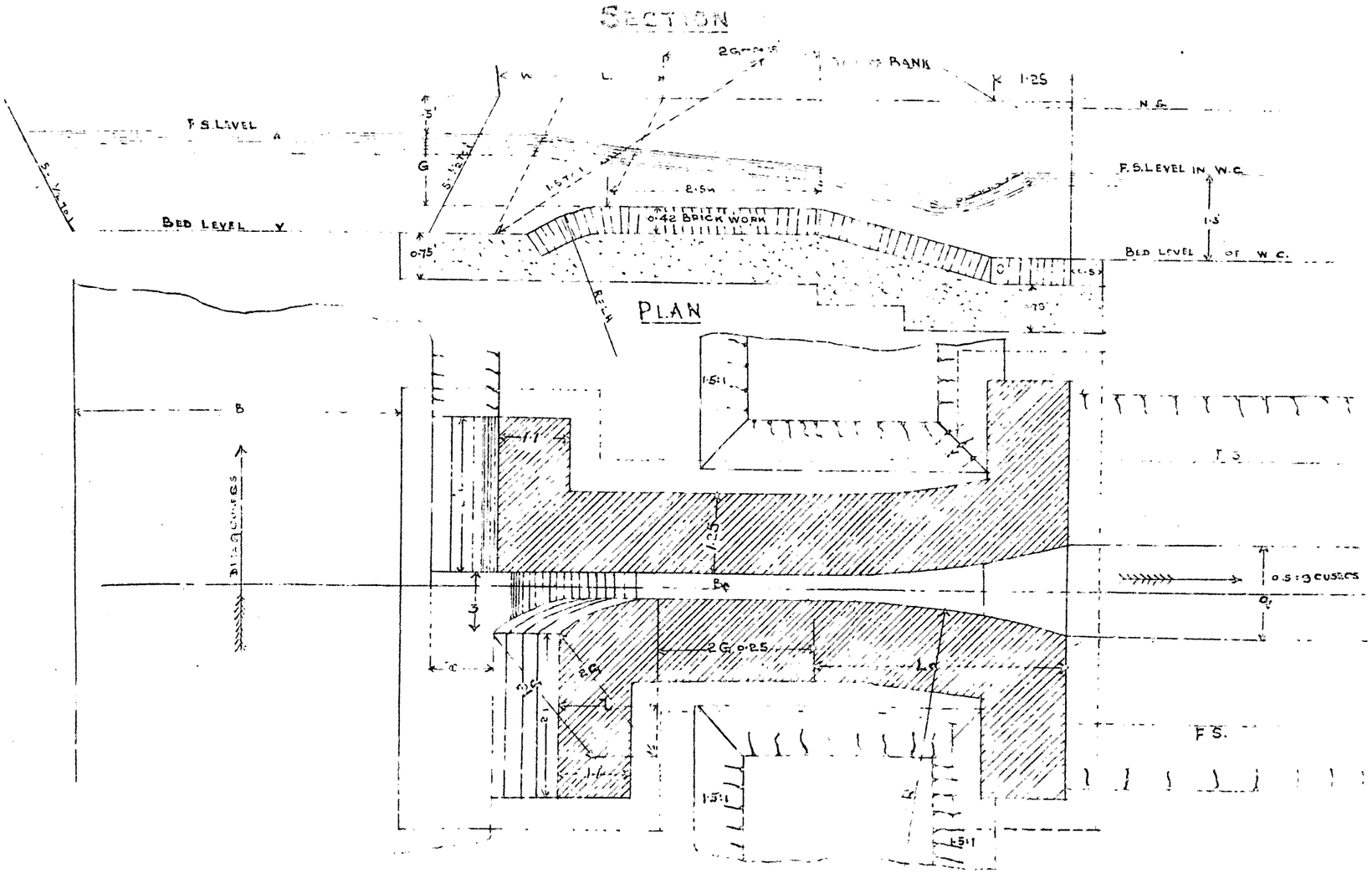
Checked 10.10.64
Asstt. Superintendent
Land records, Survey and Settlement

STATEMENT SHOWING THE IRRIGATION WORKS IN PUNJAB.

No. of work.	Name of work	Mileage in operation. Main Canal and branches.	Mileage in operation. Distributaries.	Area irrigated	Totalsum at charge.	Net Revenue.	Percentage on capital outlay to the end of the year.
			PRODUCTIVE WORKS.				
1.	Western Jumna Canal.	308 miles	1740	9,42,911	1,99,31,423	24,79,634	12.44% profit
2.	Western Jumna Extensions.	35 "	131	37,654	5,43,180	- 59,911	1.10% loss
3.	Sirhind Canal	314 "	1683	13,47,886	2,68,83,885	44,81,360	16.67% profit.
4.	Upper Bar Doab Canal	332 "	1486	13,18,523	2,16,40,967	56,55,007	26.03% "
5.	Lower Bar Doab Canal	132 "	1337	12,90,797	2,31,81,620	92,60,601	39.95% "
6.	Renala Lift irrigation	..	..		2,98,884	-1,25,328	41.93% loss.
7.	Upper Jhelum Canal	161 "	1243	7,11,270	4,30,80,165	29,46,545	6.84% profit
8.	Lower Chenab Canal	446 "	2442	25,27,423	4,80,22,006	1,69,05,104	35.20% profit.
9.	Upper Chenab Canal	128 "	586	3,42,081	4,67,10,909	11,86,641	2.54% profit.
10.	Lower Jhelum Canal	181 "	1007	930404	9,35,25,435	48,55,780	22.82 % "

11. Govt. Central Channel workshop.				11,16,775	1,39,859	8.67%	"
12. Irrigation work shop.				6,56,675	13,809	2.10%	"
13. Sutlej valley Canal	533	"	2969	16,66,131	8,88,18,727	76,88,057	8.65% "
14. Haveli Canal	328	"	1228	8,74,636	3,71,59,562	36,45,830	9.8%
15. Bhagganvale quarry	..		..	..	248	-7,163	6.11% loss
16. Thal Project	..		..	..	1,82,99,521	..	.. ..
Total	2,898		15862	1,19,89,722	40,30,90,116	5,90,65,825	14.65%
				UNPRODUCTIVE WORKS.			
17. Indus Innundation Canal	441		331	3,20,762	34,14,355	3,76,645	11.03% profit
18. Shahpur Canal	108		106	82,584	2,26,175	- 44,611	19.72% loss.
19. Mussapurnagar Canal	299		465	368594	17,08,088	2,19,986	12.88% profit
20. Ghaggar Canal	..		..	16,936	3,88,435	-1207	.31% loss.
21. Panjnad Head works	44		33	..	72,42,782	-65,097	.89% loss.
Total	892		936	7,88,876	1,29,79,835	85,716	3.74%

Chief of Prof 10.4.44
Asstt Supdt of Land records.
Survey and Settlement.



OPEN FLUME ATTO
SCALE 1/20

B = BED WIDTH OF CHANNEL
D = F.S. DEPTH
Q = DISCHARGE
q = DISCHARGE OF CUTTER
B = WIDTH OF THE CUTTER

M V Lakshmana Rao
10-4-64
Executive Engineer

5215/PW

Appendix F G—1

SUBJECT Deputation of Mysore Officers to study the Methods of Irrigation and assessment systems in the United Provinces and the Punjab.

Diary No. of letter replied to.....

General and Revenue Secretariat

( )

the 19

Date of issue.....

Signed by .....

List of enclosures.....

Copied by .....

Examined by .....

Section

File No.

Serial No.

No. P.W. 75-89 Ex 1/ADC 21744

To

The Chief Engineer for Irrigation in Mysore Bangalore.

Sir,

I am directed to forward herewith the brief note ~~redacted~~ drawn up by Messrs: M.N. Lakshman Rao, Executive Engineer and C. Rajagopal, A368 Superintendent of ~~Land Records~~ Survey on the irrigation and revenue assessment systems obtaining in Northern India and to request that the suggestions made therein

5215/PW

Appendix F G—1]

SUBJECT ..... Deputation of Mysore Officers to study the Methods of Irrigation and assessment systems in the United Provinces and the Punjab.

Section

File No.

Serial No.

Diary No. of letter replied to.....

No. P.W. 75-89 Ex 1/108
21744

To The Chief Engineer for Irrigation in Mysore Bangalore.

General and Revenue Secretariat

( )

the *19* .

Date of issue.....

Signed by .....

Sir,

I am directed to forward herewith the brief note ~~redacted~~ drawn up by Messrs: M.V. Lakshmana Rao, Executive Engineer and C. Rajagopal, Asst Superintendent of ~~Land Records~~ Survey on the irrigation and revenue assessment systems obtaining in Northern India and to request that the suggestions made therein

List of enclosures.....

Copied by .....

Examined by .....

may be examined with reference to our system of irrigation and a report submitted early for the information of Government.

Dhere

Secy to Govt
P.W. Dept
6/4/44

21/4/44

21/4/44

Gvt-2-45-1

C. F. No. 45]

P. W. SECRETARIAT.
42
Date 3-7-45

GOVERNMENT OF MYSORE

OFFICE OF

Tele gram / phone

No. 2474/S
Encls. 1 file

OFFICE OF THE CHIEF ENGINEER FOR IRRIGATION, BANGALORE

Date 30-6-45

To

The Secretary to Government,

Public Works Department, Bangalore.

Sir,

Deputation of Officers to study the irrigation system in the United Provinces & the Punjab.

Referring to your letter No.7589 dated the 2nd May 1944calling for a report on the merits of the irrigation and assessment system in vogue in the United Provinces and the Punjab as compared with those prevailing in our parts, I have the honour to state as follows, on the five important points referred to in the note:-

1. Regulation and Distribution of water.

The maximum economy secured in the Punjab and United Provinces is reported to be due to the fact that the ryots are amenable to implicitly adhere to the system of water supply and its distribution without exceptions or deviations. In our case, the triennial system of rotation with the approved system of water supply for different kinds of crops has to be worked to a successful issue and in view of the present existence of different agencies such as P.W.D. Agricultural, Revenue, working independently, there is need for greater coordination. The Facts Finding Committee have, in their meeting held in May last, solved that the appointment of a Co-ordinating Officer is

[redacted]ssary

2. Co-operative Farming.

The system as prevalent in the Punjab and the United Provinces depends much for its success on the strict observation of all the obligations called for by a colony towards Government. The members forming the nucleus of the Co-operative Society are in turn responsible

P.T.O.

responsible to the Society in respect of their individual Committments. All these therefore presuppose that there is definite cooperation in every section of activity. In our case, though there is a need for such an organisation, yet, there is need for a voluntary cooperation on the part of the ryots and the purpose could only be considered if all the interested agencies cooperate together. The disposal of the large tract of Government waste lands under the Irwin Canal and under other big projects could satisfactorily be tackled by an organisation of the kind referred to, the formation, of which may, with advantage, be expedited.

3. Lift Irrigation.

Irrigation as practised in the Cauvery and Kabbini valleys is only by gravity flow and the practice is quite popular. There does not seem to be much incentive for the ryot to take up "Lift Irrigation" which calls for special appliances and investment of extra cost. It is, therefore, necessary to work out the scheme for lift irrigation in places where facilities for gravity fed irrigation do not abundantly exist. Resorting to lift irrigation under old channels in the Cauvery and Kabbini valleys through Government Agency has its own limitations coming as it does, under the purview of the 1924 Agreement. The question of developing lift irrigation in the State is being dealt with by the Lift Irrigation Sub Committee formed by Government. The Committee has been actively considering the various phases of developing the lift irrigation issue successfully in such parts of the State where such opportunities are abundant. An Assistant Engineer from the Public Works Department is deputed under orders of Government to collect statistics in this direction.

4. Excavation of hikkals by Government.

In the Punjab and United Provinces, the lay-out of hikkals and their maintenance are reported to be done by the Public Works Department and all hikkals are the property of Government. It is considered very desirable that in all future schemes either

either under sanction or to be executed, the hikkals are excavated by Government and marked on the Revenue Map in the same way as cart tracks and maintained by Government, though extra cost is involved. The proposal would effectively control all disputes and irregularities and also enable efficient distribution.

5. Supply of water on Volumetric basis.

The selling of water by volume for irrigation will be a new feature which may not be suitable in Mysore, involving as it does, changes in the principles of land revenue Administration. Our system of measurement on the acreage basis is quite sound and well established and no change in policy is considered as called for.

The original note received with the letter under reply is herewith returned.

I have the honour to be,
Sir,
Your most obedient servant,

RM 29/6

CHIEF ENGINEER FOR IRRIGATION

29.6.45